MS1-531US

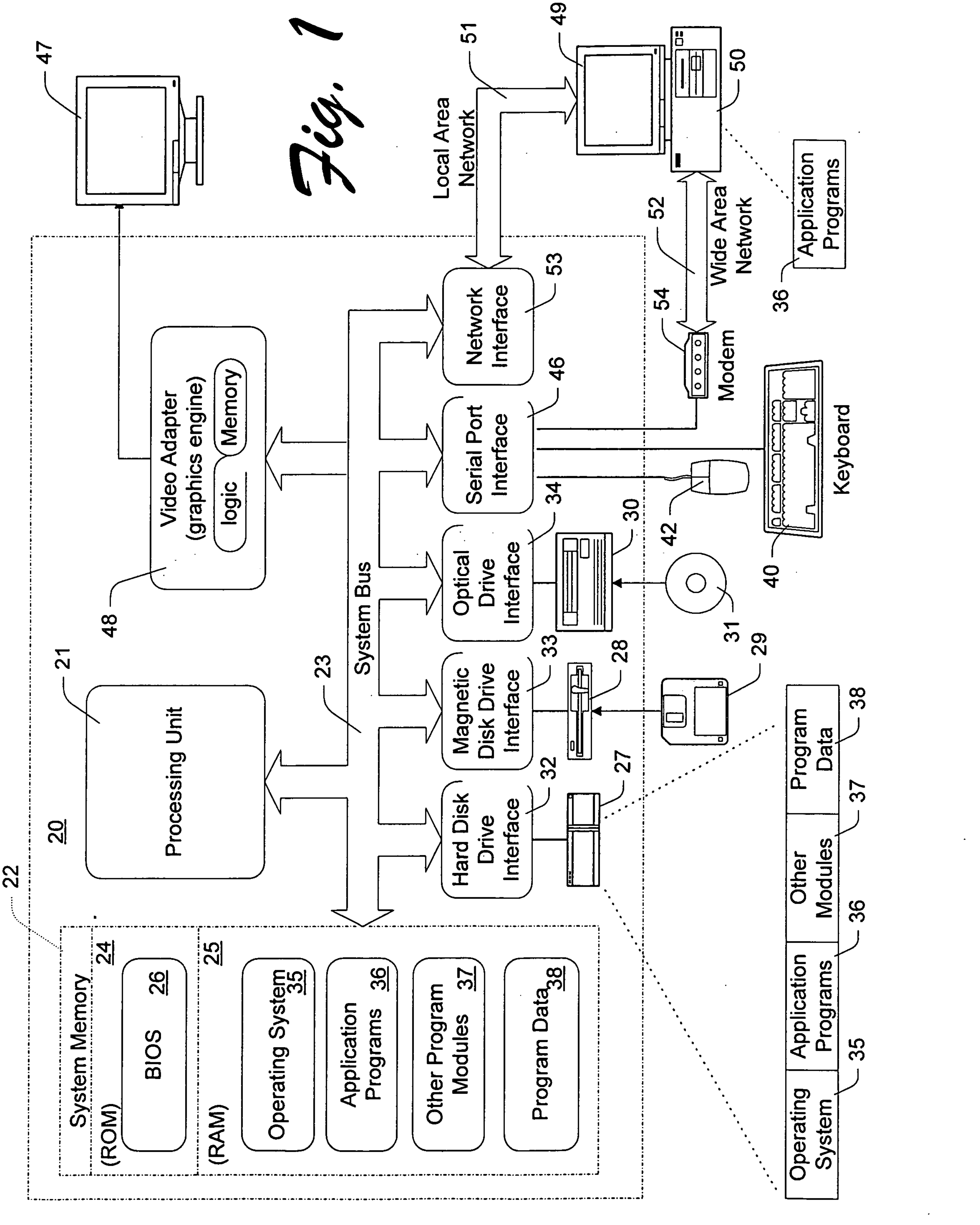
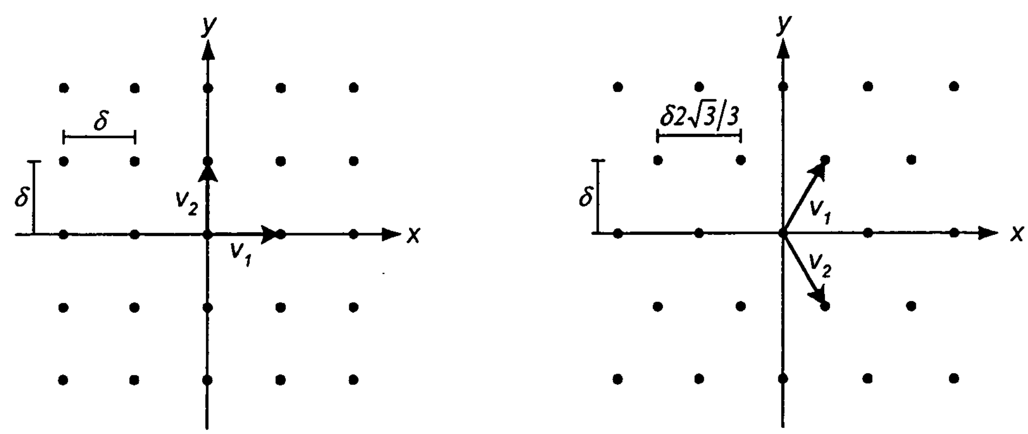


Fig. 1

100

	Map name	Sampling Requirement	Minimum Isotropy	Map Components
	OpenGL	∞	0	1
102	Cube	24	0.58	6
	Dual Stereographic	32	1	2
	Lat/Long	19.7	0	1
	Dual Equidistant*	19.7	0.64	2
	Low Distortion Area Preserving*	19.7	0.29	1
104	Polar-Capped* (stretch invariant)	14.8	0.71	3
	Polar-Capped* (conformal)	16.5	1	3
	Polar-Capped* (hexagonally reparameterized)	13.5	0.58	3
106	Optimal Isometric**	12.57	1	∞
	Optimal**	10.9	0.58	∞

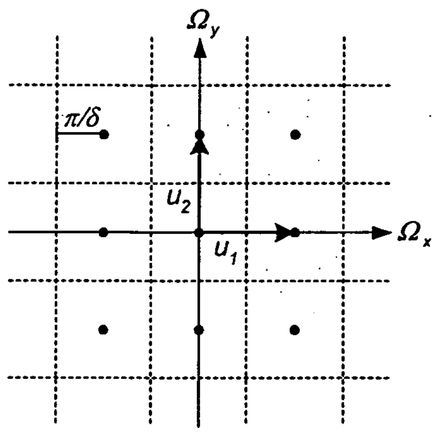
Fig. 2



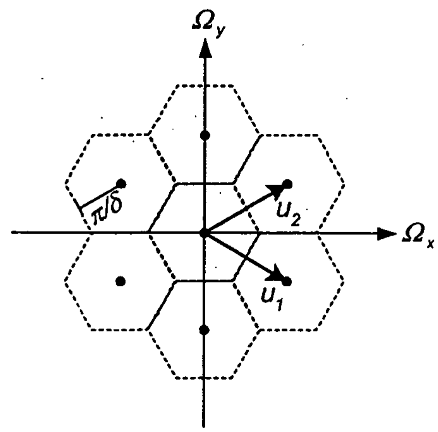
(a) rectangular

(b) hexagonal

Fig. 3



(a) rectangular



(b) hexagonal

Fig. 4

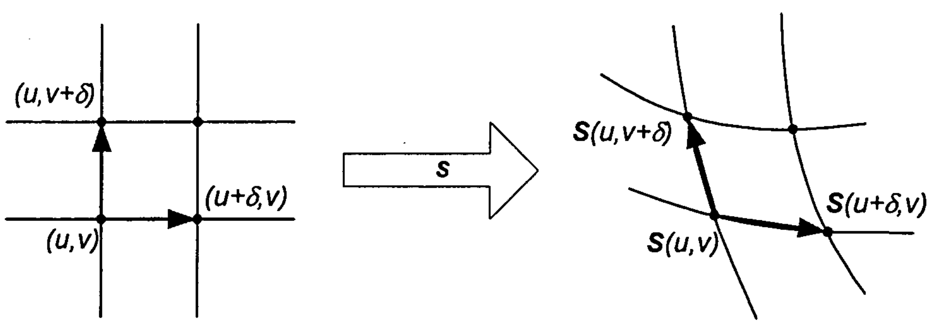
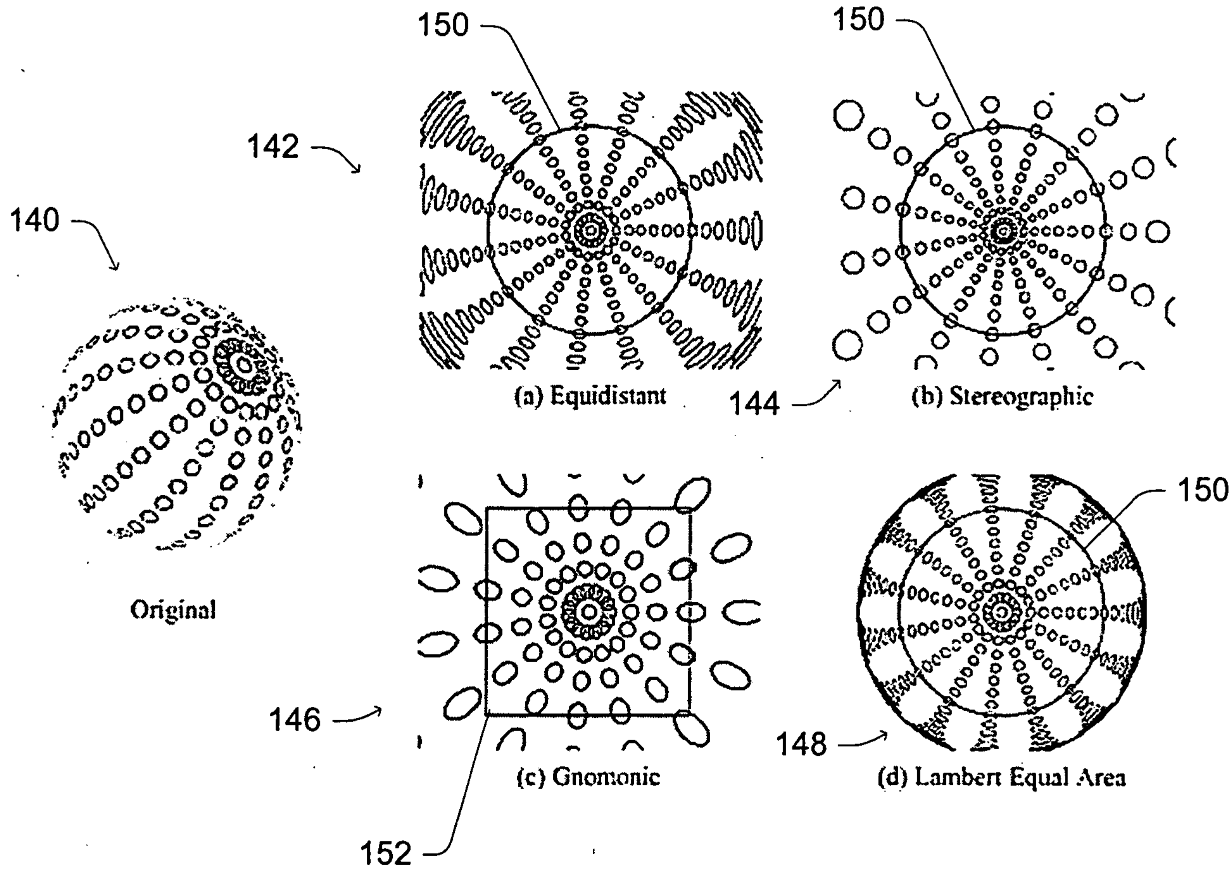


Fig. 5



140
142
150
150
144
150
146
148
152
Original
(a) Equidistant
(b) Stereographic
(c) Gnomonic
(d) Lambert Equal Area

Fig. 6

200

	Equidistant	Gnomonic	Stereographic	Lambert Equal Area
$\theta(r)$	$(\pi/2)r$	$\cos^{-1}\left(\sqrt{1/(r^2+1)}\right)$	$\cos^{-1}\left((1-r^2)/(1+r^2)\right)$	$\cos^{-1}(1-r^2)$
properties	stretch-preserving	projects great circles to lines	conformal, projects circles to circles	area-preserving
r* covering hemisphere	[0, 1]	$[0, \infty]$	[0, 1]	[0, 1]
r* covering sphere	[0, 2]	–	$[0, \infty]$	$[0, \sqrt{2}]$
$r(\theta)$	$2\theta/\pi$	$\tan\theta$	$\tan(\theta/2)$	$\sqrt{1-\cos\theta}$
$\sin\theta$	$\sin((\pi/2)r)$	$r/\sqrt{r^2+1}$	$2r/(1+r^2)$	$r\sqrt{2-r^2}$
$\cos\theta$	$\cos((\pi/2)r)$	$\sqrt{1/(r^2+1)}$	$(1-r^2)/(1+r^2)$	$1-r^2$
$\lambda_1(\theta)$	$\pi/2$	$\cos\theta$	$1+\cos\theta$	$2/\sqrt{1+\cos\theta}$
$\lambda_2(\theta)$	$(\pi/2)\operatorname{sinc}\theta$	$\cos^2\theta$	$1+\cos\theta$	$\sqrt{1+\cos\theta}$
$\alpha(\theta)$	$\operatorname{sinc}\theta$	$\cos\theta$	1	$(1+\cos\theta)/2$
$\tau(\theta)$	$(\pi/2)^2\operatorname{sinc}\theta$	$\cos^3\theta$	$(1+\cos\theta)^2$	2
$\lambda_1^*(\theta)$	$\pi/2$	1	2	$2/\sqrt{1+\cos\theta}$
$M_S(\theta)$	$4\theta^2$	$4\tan^2\theta$	$16\tan^2(\theta/2)$	$16\tan^2(\theta/2)$
inverse map	$f=(\pi/2)\operatorname{sinc}(\cos^{-1}z)$ $u=x/f$ $v=y/f$	$u=x/z$ $v=y/z$	$u=x/(1+z)$ $v=y/(1+z)$	$u=x/\sqrt{1+z}$ $v=y/\sqrt{1+z}$

Fig. 7

500

	Plane Chart	Equal Area	Mercator
$\theta(v)$	$2\pi v$	$\sin^{-1} v$	$\sin^{-1}(\tanh(2\pi v))$
properties	stretch-preserving	area-preserving	conformal
v covering sphere	$[-1/4, 1/4]$	$[-1, 1]$	$[-\infty, \infty]$
$v(\theta)$	$\theta/(2\pi)$	$\sin\theta$	$\tanh^{-1}(\sin\theta)/(2\pi)$ $=\ln((1+\sin\theta)/(1-\sin\theta))/(2\pi)$
$\cos\theta$	$\cos(2\pi v)$	$\sqrt{1-v^2}$	$\mathrm{sech}(2\pi v)$ $=2/(e^{-2\pi v}+e^{2\pi v})$
$\sin\theta$	$\sin(2\pi v)$	v	$\tanh(2\pi v)$ $=(e^{2\pi v}-e^{-2\pi v})/(e^{2\pi v}+e^{-2\pi v})$
$\lambda_1(\theta)$	2π	$\max(1/\cos\theta, 2\pi\cos\theta)$	$2\pi\cos\theta$
$\lambda_2(\theta)$	$2\pi\cos\theta$	$\min(1/\cos\theta, 2\pi\cos\theta)$	$2\pi\cos\theta$
$\alpha(\theta)$	$\cos\theta$	$\min(1/(2\pi\cos^2\theta), 2\pi\cos^2\theta)$	1
$\tau(\theta)$	$4\pi^2\cos\theta$	2π	$4\pi^2\cos^2\theta$
$\lambda_1^*(\theta)$	2π	$\max(1/\cos\theta, 2\pi)$	2π
$M_S(\theta)$	$2\pi\theta$	$\max(1/\cos^2\theta, 4\pi^2)\sin\theta$	$2\pi\tanh^{-1}(\sin\theta)$ $=\pi\ln((1+\sin\theta)/(1-\sin\theta))$
inverse map	$u=(\mathrm{atan2}(y,x))/(2\pi)$ $v=(\sin^{-1}z)/(2\pi)$	$u=(\mathrm{atan2}(y,x))/(2\pi)$ $v=z$	$u=(\mathrm{atan2}(y,x))/(2\pi)$ $v=\tanh^{-1}z/(2\pi)$ $=\ln((1+z)/(1-z))/(4\pi)$

Fig. 12

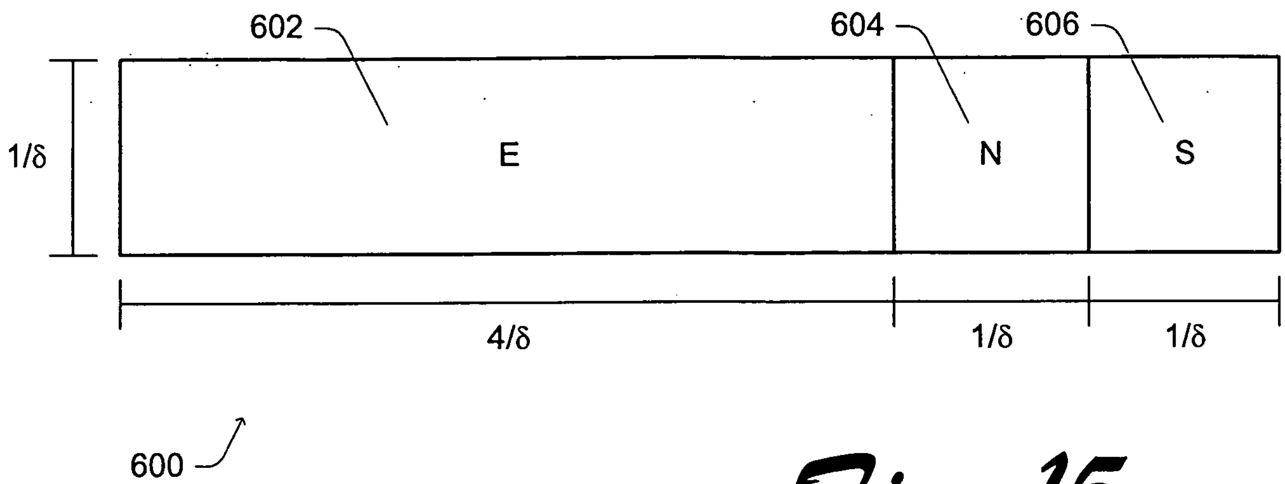
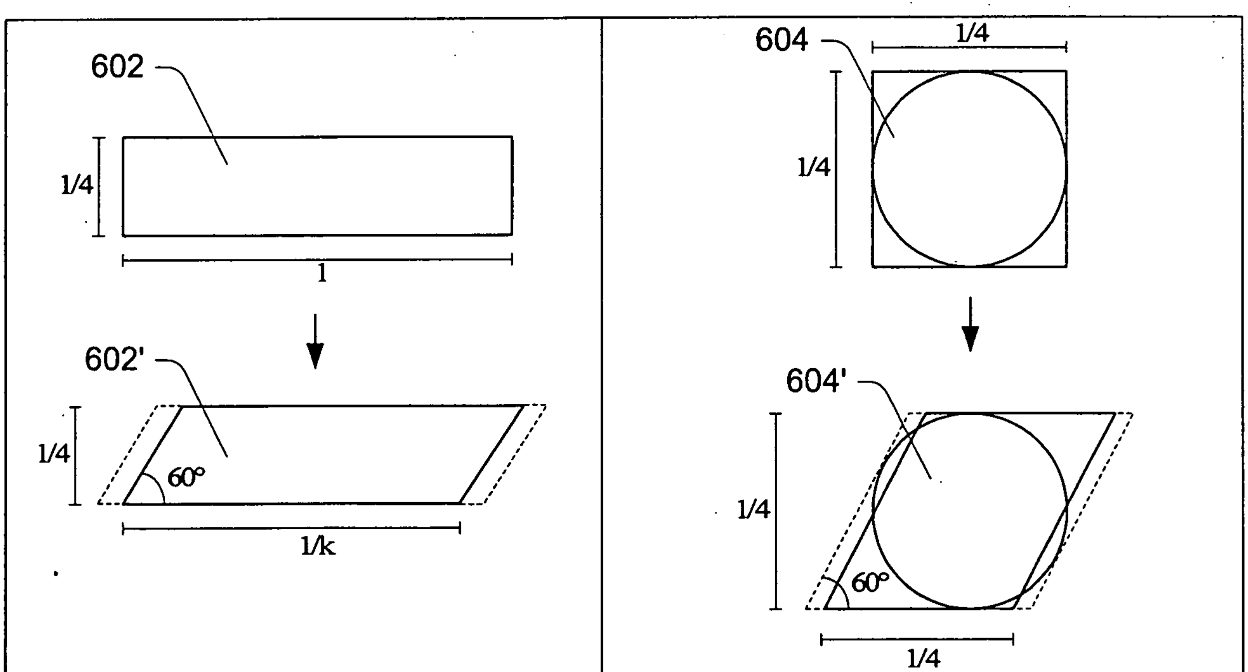


Fig. 15



(a) reparameterized equatorial domain

(b) reparameterized polar domain

Fig. 16